(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
20 March 2003 (20.03.2003)

PCT

(10) International Publication Number
WO 03/023246 A1

(51) International Patent Classification[7]: F16D 65/20, 65/18, 65/21, 65/22, B60T 7/12

(21) International Application Number: PCT/AU02/01191

(22) International Filing Date: 30 August 2002 (30.08.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PR 7554 7 September 2001 (07.09.2001) AU

(71) Applicant *(for all designated States except US)*: **SAFE EFFECT PTY LTD** [AU/AU]; Suite 3, 75 Erindale Road, Balcatta, Western Australia 6021 (AU).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **NOWAK, Stan** [AU/AU]; Suite 3, 75 Erindale Road, Balcatta, Western Australia 6021 (AU). **KIERONSKA, Dorota, Helena** [AU/AU]; Suite 3, 75 Erindale Road, Balcatta, Western Australia 6021 (AU). **MORLEY, Vin, C.** [AU/AU]; Suite 3, 75 Erindale Road, Balcatta, Western Australia 6021 (AU).

(74) Agent: **MIZZI, Anthony, Paul**; Griffith Hack Patent Attorneys, 6th Floor, 256 Adelaide Terrace, Perth, Western Australia 6000 (AU).

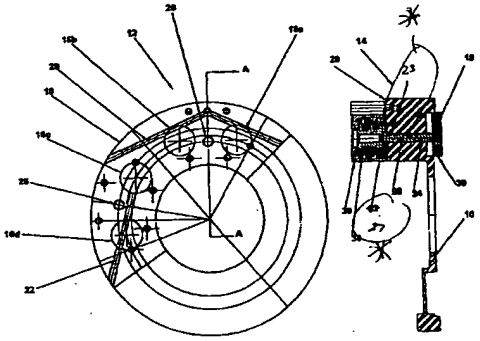
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *with amended claims*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: PARK BRAKE FOR A DISC BRAKE SYSTEM AND DISC BRAKE SYSTEM INCORPORATING SAME



(57) **Abstract:** A park brake (14) is incorporated into a housing (10) of a disc brake system (12). The housing (10) is in the form of an annular ring having a plurality of cavities (16) for housing service brake pistons which act on brake pads (18) to selectively force the brake pads (18) onto a brake disc to produce a surface brake effect. The park brake (14) includes an actuator (23) supported by the housing (10) which is switchable between an applied state where it forces the brake pad (18) into contact with the brake disc of the system (10) independent of the action of the service brake pistons to produce a park brake effect, and a released state where the actuator (23) allows the brake pad (18) to become disengaged from the brake disc. The actuator (23) includes a hydraulically operated park brake piston (27) having a rod (24) extending therefrom. The rod (24) is slidably retained within a hole (26) formed in the housing (10) and is arranged to abut or otherwise apply force to the brake pad (18). When fluid pressure is applied to the pad brake piston (27) it retracts the rod (27) into the housing (10) releasing the park brake (14). In the absences of the application of fluid pressure, a spring (34) of the actuator (23) operates to switch the actuator (23) to an applied state where the rod (24) pushes on the pad (18) forcing it into contact with the brake disc thereby providing the park brake effect.

WO 03/023246 A1

PARK BRAKE FOR A DISC BRAKE SYSTEM AND DISC BRAKE SYSTEM INCORPORATING SAME

Field of the Invention

The present invention relates to a park brake for a disc brake system and, to a disc brake system incorporating said park brake.

Background of the Invention

Typically, a park brake for a disc brake system includes a drum attached to a brake disc and a pair of brake shoes adapted for engaging an inside surface of the drum. The brake shoes are usually moved into contact with the drum by pulling on a brake lever.

The provision of a park brake in this manner for a disc brake system involves significant expense, and adds additional weight and complexity to the braking system.

Summary of the Invention

According to a first aspect of the present invention there is provided a park brake for a disc brake system having a housing in which is disposed at least one service brake piston and having an associated brake pad on which said at least one piston can act for engaging said brake pad with a brake disc, said park brake including:

an actuator supported by said housing and operatively associated with said brake pad, said actuator switchable between an applied state where said actuator forces said brake pad into engagement with said brake disc independent of action of said service brake piston, and a released state where said actuator allows said brake pad to disengage said brake disc.

Preferably said actuator includes bias means for biasing said actuator into said applied state.

Preferably said actuator includes a member arranged to abut or otherwise transfer force to said brake pad and operational means for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

Preferably, said operational means includes hydraulic means supported by said housing for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

Preferably said hydraulic means includes a piston and said member is a rod extending from said piston.

Alternately said operational means includes a mechanical linkage coupled to said housing and said member for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

In a further alternate embodiment, said operational means includes electrical means supported by said housing and coupled to said member for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state. In this embodiment, said electrical means includes a solenoid wherein said member constitutes a plunger of said solenoid.

According to another aspect of the present invention, there is provided a disc brake system including at least:

a service brake including a housing in which is disposed at least one service brake piston, and a brake pad associated with said at least one service brake piston;

a rotatable brake disc adjacent said housing which said brake pad can selectively engage for providing a service braking effect; and

a park brake including an actuator supported by said housing and operatively associated with said brake pad, said actuator switchable between an applied state where said actuator forces said brake pad into engagement with said brake disc independent of action of said service brake piston, and a released state where said actuator allows said brake pad to disengage said brake disc.

Preferably said service brake includes with one or more pairs of service brake pistons wherein a single brake pad is associated with each pair of service brake pistons; and wherein said park brake includes an actuator disposed intermediate the service brake pistons in each of said pair of pistons.

Brief Description of the Drawings

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a plan view of a body of a disc brake system incorporating an embodiment of the park brake;

Figure 2 is a view of section AA taken through the body depicted in Figure 1 when a brake pad incorporated in the disc brake system is at a maximum state of wear;

Figure 3 is a view of section AA taken through the body depicted in Figure 1 when a brake pad incorporated in the disc brake system is at a state of no wear;

Figure 4 is a plan view of a spring and piston housing incorporated in the park brake;

Figure 5 is a view through section BB of the housing depicted in Figure 4;

Figure 6 is a view through section CC of the housing depicted in Figure 4; and,

Figure 7 is a view through section DD of the housing depicted in Figure 4.

Detailed Description of Preferred Embodiments

Figures 1-3 depict a housing 10 of a disc brake system 12 which incorporates an embodiment of the park brake 14 in accordance with the present invention. The housing 10 is in the form of an annular ring provided with a plurality of cavities 16a-16d (hereinafter referred to in general as "cavities 16") for housing service brake pistons (not shown). In this particular embodiment, the service brake pistons operate in pairs with the pistons housed in cavities 16a and 16b forming one pair, and those housed in cavities 16c and 16d operating as a second pair. Respective brake pads 18 (only one shown in Figures 2 and 3) are associated with each piston pair. The pairs of pistons in cavities 16 and their associated brake pads 18 form, or operate as, the service brake in the disc brake system 12.

A fluid gallery 20 is provided internally of the housing 10 for providing pressurised fluid to cavities 16a and 16b to force the corresponding service brake pistons and thus the associated brake pad 18 into engagement with a brake disc (not shown) attached to a rotating axle (not shown). A further gallery 22 is formed in the housing 10 to provide pressurised fluid to the brake pistons housed within cavities 16c and 16d for likewise forcing an associated brake pad 18 into engagement with the brake disc.

The housing 10 may include further cavities 16 for providing additional service brakes. The specific configuration of cavities 16 is not critical to the present invention. Nevertheless, advantageously, the cavities 16 and the service brake pistons (not shown) housed within the cavities 16 may be in the form depicted in Applicant's corresponding Application No. PR7395, the contents of which are incorporated herein by way of reference. Further, an alternate form of housing 10 which may be incorporated in embodiments of the present invention may be in the form depicted in Applicant's corresponding Provisional Application No. PR7393, the contents of which is incorporated herein by way of reference.

The park brake 14 in accordance with an embodiment of the present invention includes an actuator 23 supported by the housing 10 and operatively associated with a brake pad 18. The actuator 23 is switchable between an applied state (shown in Figure 2) where it forces the brake pad 18 into contact with the brake disc of the system 10 independent of the action of the service brake pistons to produce a park brake effect, and a released state (shown in Figure 3) where the actuator allows the brake pad 18 to become disengaged from the disc. The actuator 23 has a member in the form of a rod 24 that is slidably retained within transverse hole 26 formed in the housing 10, and an operation means in the form of a hydraulic park brake piston 27 for moving the rod 24. In this particular embodiment, two park brakes are incorporated in the brake system 12 shown in Figure 1. Advantageously, each park brake 14 and corresponding hole 26 is disposed between the service brake pistons (not shown) which constitute the abovementioned piston pairs housed within cavity 16a and 16b; and, 16c and 16d. The rod 24 constitutes an axial extension of an associated park brake piston 27. The holes 26 extend for the full width of the housing 10 and are closed at a back face 28 of the housing 10 by a respective park brake piston housing 30 which house the park brake piston 27.

Bias means in the form of a *bellville* spring 34 acts between the piston 27 and the housing 30 to bias the actuator 23 toward an applied state. In the applied state, the rod 24 acts on the pad 18 (which is associated with the service brake pistons housed in the adjacent cavities 16) forcing it into contact with the brake disc (not shown) of the disc brake system 12. This action is independent of the action provided by the service brake pistons held within the cavities 16. That is, the park brake 14 acts independently of the service brake.

In this particular embodiment, in order to switch the actuator 23 to a released state, i.e. to release the park brake 14, pressurised fluid is supplied to the housing 30 to act between the piston 27 and back face 28 of housing 10 to compress a spring 34 effectively retracting the rod 24 to allow the pad 18 to be disengaged or otherwise released from the brake disc.

Referring to Figures 4-7, the piston housing 30 is provided with a brake fluid inlet 36

which is placed in fluid communication with a master cylinder for supplying pressurised brake fluid to the park brake 14. The inlet 36 is in fluid communication with an internal duct 38 for directing the pressurised brake fluid to a region between the piston 27 and back face 28 of the housing 10.

Housing 30 also includes a bleed duct 40 which extends from between an inside face 42 and the back face 38 through the housing 30 to a bleed valve port 44. This allows the bleeding of brake fluid through the housing 30.

The housing 30 also includes a cavity 46 for housing the piston 27 and spring 34.

As mentioned above, the present illustrated park brake system 14 is released or operated by the application of fluid pressure, and is automatically or self applied in the absence of fluid pressure. This arrangement is particularly well adapted for use with Applicant's dual hydraulic brake circuit described in co-pending Provisional Application No. PR7394, the contents of which are incorporated herein by way of reference. In the dual hydraulic brake circuit, two master cylinders are incorporated, one being used as the primary master cylinder for providing fluid pressure to the service brakes while the other acts as a standby master cylinder in the event of failure of the primary master cylinder. However the standby master cylinder can be used with the present park brake system 14 for providing fluid pressure for releasing the park brake 14. In this regard, a solenoid activated valve (not shown) can be incorporated to allow pressure from the standby master cylinder to compress the spring 34 thus releasing the park brake. It will be appreciated that in such a system, when vehicle ignition is turned OFF, the master cylinders do not pressurise the brake fluid and accordingly, the park brake 14 is automatically deployed.

Now that an embodiment of the present invention has been described in detail it will be apparent to those skilled in the relevant arts that numerous modifications and variations may be made without departing from the basic inventive concepts. For example, depending on the size (diameter) of the housing 10 of the disc brake system 12, it may be possible to incorporate two rods 24 (and associated pistons 27) between the service

brake pistons in each service brake piston pair. Also, in the depicted embodiment, the actuator 23 is described and illustrated as being hydraulically operated. However the actuator 23 may be operated by other means including by mechanical linkages and levers, or electrically. With an electrical actuator, the rods 24 may be formed as respective moving cores or plungers of solenoids which, when energised, is equivalent to switching the actuator to the released state, i.e. retracting the rods against the bias of spring 34, and when de-energised is equivalent to switching the actuator to the applied state, where the spring 34 is released thereby pushing the rods 24 and subsequently the brake pads 18 into engagement with the brake disc to provide a park brake effect.

All such modifications and variations are deemed to be within the scope of the present invention the nature of which is to be determined from the above description, and the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS.

1. A park brake for a disc brake system having a housing in which is disposed at least one service brake piston and having an associated brake pad on which said at least one piston can act for engaging said brake pad with a brake disc, said park brake including:

an actuator supported by said housing and operatively associated with said brake pad, said actuator switchable between an applied state where said actuator forces said brake pad into engagement with said brake disc independent of action of said service brake piston, and a released state where said actuator allows said brake pad to disengage said brake disc.

2. A park brake according to Claim 1 wherein said actuator includes bias means for biasing said actuator into said applied state.

3. A park brake according to Claim 2 wherein said actuator includes a member arranged to abut or otherwise transfer force to said brake pad and operational means for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

4. A park brake according to Claim 3 wherein said operational means includes hydraulic means supported by said housing for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

5. A park brake according to Claim 4 wherein said hydraulic means includes a piston and said member is a rod extending from said piston.

6. A park brake according to Claim 3 wherein said operational means includes a mechanical linkage coupled to said housing and said member for moving said member

into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

7. A park brake according to Claim 3 wherein said operational means includes electrical means supported by said housing and coupled to or otherwise associated with said member for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

8. A park brake according to Claim 8 wherein said electrical means includes a solenoid wherein said member constitutes a plunger of said solenoid.

9. A disc brake system including at least:

a service brake including a housing in which is disposed at least one service brake piston, and a brake pad associated with said at least one service brake piston;

a rotatable brake disc adjacent said housing which said brake pad can selectively engage for providing a service braking effect; and

a park brake including an actuator supported by said housing and operatively associated with said brake pad, said actuator switchable between an applied state where said actuator forces said brake pad into engagement with said brake disc independent of action of said service brake piston, and a released state where said actuator allows said brake pad to disengage said brake disc.

10. The system according to Claim 9 wherein said service brake includes with one or more pairs of service brake pistons wherein a single brake pad is associated with each pair of service brake pistons; and wherein said park brake includes an actuator disposed intermediate the service brake pistons in each of said pair of pistons.

11. The system according to Claim 9 or 10 wherein said actuator includes bias

means for biasing said actuator into said applied state.

12. The system according to Claim 11 wherein said actuator includes a member arranged to abut or otherwise transfer force to said brake pad and operational means for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

13. The system according to Claim 12 wherein said operational means includes hydraulic means supported by said housing for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

14. The system according to Claim 13 wherein said hydraulic means includes a piston and said member is a rod extending from said piston.

15. The system according to Claim 12 wherein said operational means includes a mechanical linkage coupled to said housing and said member for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

16. The system according to Claim 12 wherein said operational means includes electrical means supported by said housing and coupled to or otherwise associated with said member for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

17. The system according to Claim 16 wherein said electrical means includes a solenoid wherein said member constitutes a plunger of said solenoid.

AMENDED CLAIMS

[received by the International Bureau on 30 December 2002 (30.12.02)
original claims 1-17 have been replaced by amended claims 1-17]

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS.

1. A park brake for a disc brake system having a brake housing in which is disposed at least one service brake piston and having an associated brake pad on which said at least one piston can act for engaging said brake pad with a brake disc, said park brake including:

an actuator having an actuator casing adapted for coupling to said brake housing, said actuator including a member extending from said actuator casing and arranged to abut or otherwise transfer force to said brake pad, said actuator switchable between an applied state where said member forces said brake pad into engagement with said brake disc independent of action of said service brake piston, and a released state where said member allows said brake pad to disengage said brake disc.

2. A park brake according to Claim 1 wherein said actuator includes bias means for biasing said actuator into said applied state.

3. A park brake according to Claim 2 wherein said actuator includes operational means for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

4. A park brake according to Claim 3 wherein said operational means includes hydraulic means disposed in said actuator casing for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

5. A park brake according to Claim 4 wherein said hydraulic means includes a piston and said member is a rod extending from said piston.

6. A park brake according to Claim 3 wherein said operational means includes a mechanical linkage disposed in or supported by said actuator casing for moving said

member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

7. A park brake according to Claim 3 wherein said operational means includes electrical means supported by said housing and coupled to or otherwise associated with said member for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

8. A park brake according to Claim 8 wherein said electrical means includes a solenoid wherein said member constitutes a plunger of said solenoid.

9. A disc brake system including at least:

a service brake including a housing in which is disposed at least one service brake piston, and a brake pad associated with said at least one service brake piston;

a rotatable brake disc adjacent said housing which said brake pad can selectively engage for providing a service braking effect; and

a park brake including an actuator having an actuator casing coupled to said housing, said actuator operatively associated with said brake pad and switchable between an applied state where said actuator forces said brake pad into engagement with said brake disc independent of action of said service brake piston, and a released state where said actuator allows said brake pad to disengage said brake disc.

10. The system according to Claim 9 wherein said service brake includes with one or more pairs of service brake pistons wherein a single brake pad is associated with each pair of service brake pistons; and wherein said park brake includes an actuator disposed intermediate the service brake pistons in each of said pair of pistons.

11. The system according to Claim 9 or 10 wherein said actuator includes bias means for biasing said actuator into said applied state.

12. The system according to Claim 11 wherein said actuator includes a member extending from said actuator casing and arranged to abut or otherwise transfer force to said brake pad, and operational means for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

13. The system according to Claim 12 wherein said operational means includes hydraulic means disposed in said actuator casing for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

14. The system according to Claim 13 wherein said hydraulic means includes a piston and said member is a rod extending from said piston.

15. The system according to Claim 12 wherein said operational means includes a mechanical linkage disposed in or supported by said actuator housing and said member for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

16. The system according to Claim 12 wherein said operational means includes electrical means disposed in said actuator housing and coupled to or otherwise associated with said member for moving said member into contact with said brake pad and forcing said brake pad into engagement with said brake disc when said actuator is in said applied state.

17. The system according to Claim 16 wherein said electrical means includes a solenoid wherein said member constitutes a plunger of said solenoid.

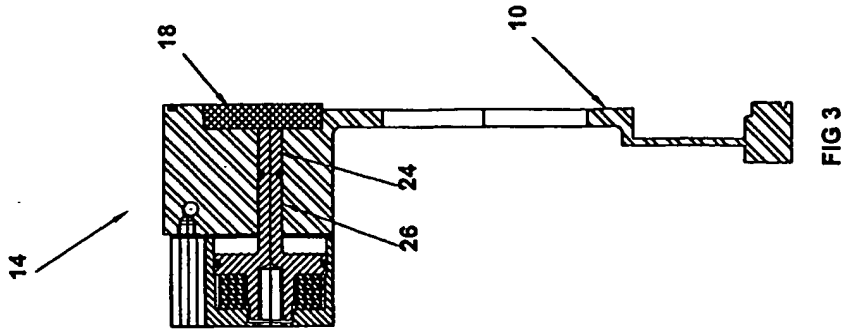


FIG 3

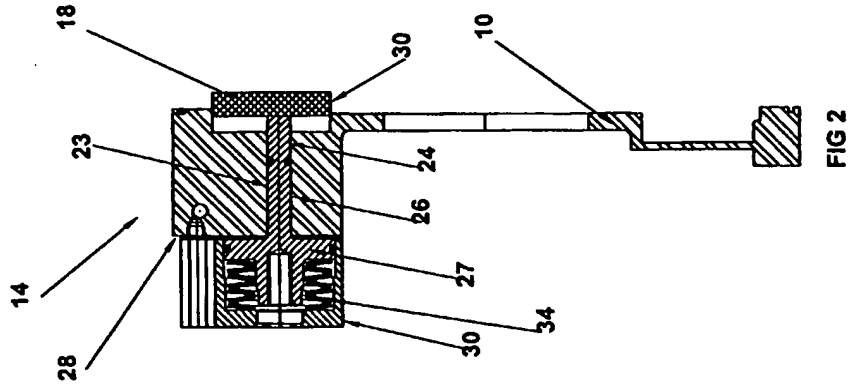


FIG 2

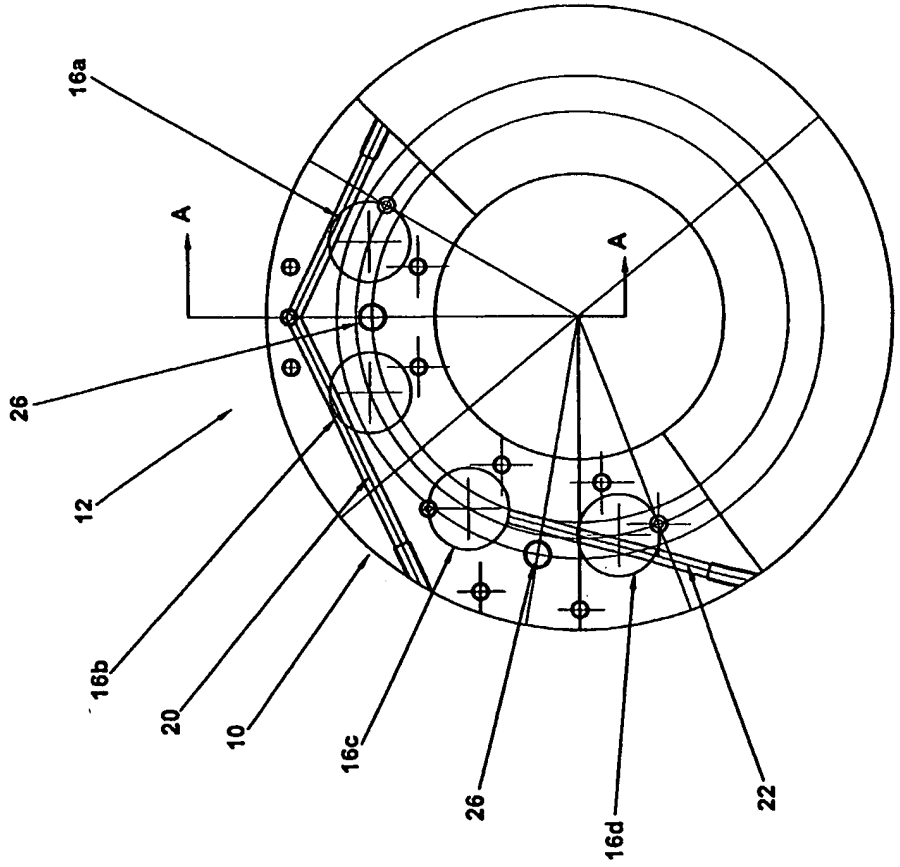
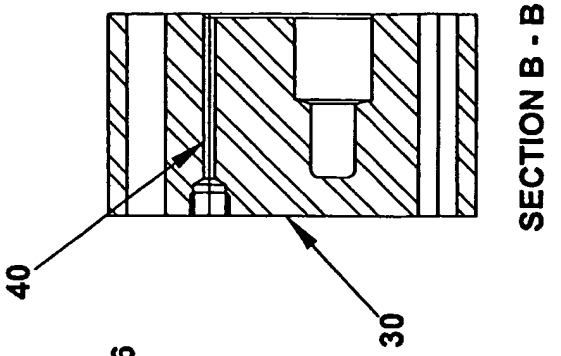
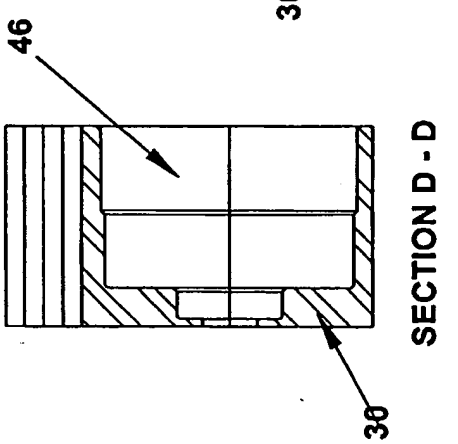


FIG 1



SECTION B - B

FIG 5



SECTION D - D

FIG 7

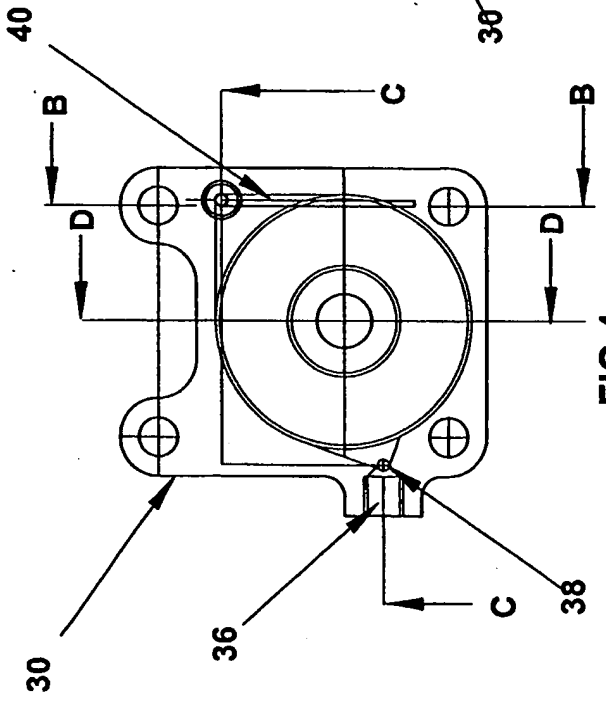
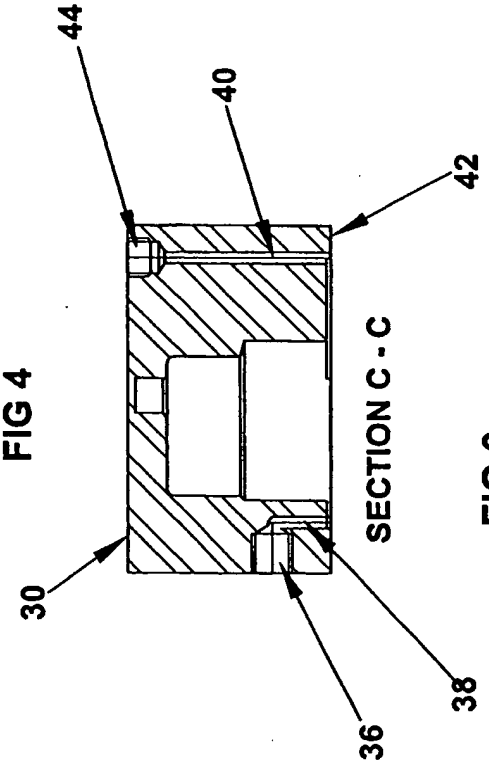


FIG 4



SECTION C - C

FIG 6

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU02/01191

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: F16D 65/20, 65/18, 65/21, 65/22, B60T 7/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI: IPC: F16D 65/-, F16D 55/-, B60T 7/- with keywords: park, hand, brake, disc and disk.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	WO 98/05879 A (BRAKE TECHNOLOGIES PTY LTD) 12 February 1998	
X	Whole document	1-6, 9-15
Y	Whole document	7, 16
	DE 19732168 C1 (LUCAS INDUSTRIES PLC) 7 January 1999	
Y	Whole document (& US 6394235A)	7, 16
	US 4018140 A (GENERAL SIGNAL CORPORATION) 19 April 1977	
A	Whole document	

☐ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 October 2002	25 OCT 2002
Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	**KURT TOBLER** Telephone No : (02) 6283 2469

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU02/01191

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	9805879	AU	36890/97	BR	9711179	CN	1231716
		EP	916036	NZ	334456	US	6412612
DE	2559501	EP	996560	DE	19732168	WO	9905011
US	4018140	CA	1024910	US	6394235	FR	2274832
		GB	1488742	IT	1035557	DE	2526525
		ZA	7502438				

END OF ANNEX